

SANTA CLARA VALLEY WATER DISTRICT

SEDIMENT CHARACTERIZATION PLAN (FINAL)

FOR THE

SAN FRANCISCO BAY REGION

MULTI-YEAR STREAM MAINTENANCE PROGRAM

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## INTRODUCTION

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The Santa Clara Valley Water District (District) proposes to conduct sediment removal activities (dredging) on thirty-six (36) creeks over the next ten (10) years. The purpose of the program is to alleviate local flooding problems and to meet the requirements of the Federal Emergency Management Agency for flood protection. Under the Multi-Year Stream Maintenance Program, an approximate average of 73,070 cubic yards (cy) of sediment will be removed annually. In order to effectively manage the removal and disposal of the sediments, it is necessary to characterize the physical and chemical properties of the sediments. This characterization allows the District to (1) effectively plan for disposal of the sediments, (2) assist with determining the best management practices (BMP) to implement, and (3) efficiently monitor the water quality impacts from the sediment removal operation.

Under the Multi-Year Program, sediment will be tested using the San Francisco Bay Regional Water Quality Control Board's (Regional Board) Wetland Screening Criteria to facilitate any beneficial reuse of sediment generated by the District at its proposed wetlands site. The physical and chemical properties of sediments tested by the District include metals, pesticides and organophosphorous compounds, polychlorinated biphenyls, polynuclear aromatic hydrocarbons, moisture content, grain size, attenbergh limits, total organic carbon, asbestos, chloride, pH, total sulfides, ammonia, and toxicity. The applicable water quality objectives included in the San Francisco Bay Region Basin Plan (the Basin Plan) for surface waters are: pH, salinity, sulfide, dissolved oxygen, turbidity, toxicity, ammonia, metals, temperature, taste and odor, suspended/settleable/floating material, oil and grease, sediment, population and community ecology, bioaccumulation, and bacteria.

According to the Basin Plan, the Regional Board establishes and enforces Waste Discharge Requirements (WDR) for point and nonpoint source of pollutants at levels necessary to meet numerical and narrative water quality objectives. The sediment tests performed by the District each year, as part of its stream maintenance program, were developed since 1997, based on the historic occurrence of pollutants within Santa Clara Valley streams, in accordance with the Basin Plan water quality objectives, and the Regional Board's WDR through a stakeholder process. The stakeholder process and lessons learned meetings involved participation of the Regional Board, the California State Department of Fish and Game (DFG), the U.S. Environmental Protection Agency (EPA), the U.S. Army Corps of Engineers (Corps), and various environmental organizations which assisted the District in continuous evaluation and improvement of the sediment characterization plan since 1997.

The sediment characterization plan proposed for the District's Multi-Year Stream Maintenance Program, as presented herein, is a result of the District's sediment testing and evaluation effort, and continuous improvement process based on guidance from regulatory agencies and other stakeholders, since 1997.

In addition to characterizing the sediments based on statistical characterization method, the Sediment Characterization Plan incorporates a biased approach to characterize the areas with the highest potential to have pollutants. This biased sampling involves continuous core sediment sampling at selected locations, such as storm water outfalls and runoffs, and sediment deposition areas where there is a potential to detect pollutants. The goal of "continuous core" sampling is to determine the "worst case" characterization of the sediment (i.e., to most likely detect maximum number of contaminants at highest concentrations). This information will assist in determining the suitability for disposal of sediment, the type of BMPs to be implemented during sediment removal operations, and provides a basis for the self-monitoring program constituents.

## SCOPE OF SEDIMENT PLAN

This sampling plan documents sampling and analytical procedures which will be utilized for the creek sites under the Multi-Year Sediment Removal Program. It is not intended to be a full characterization of all the stream sediments. The Sediment Characterization Plan is primarily designed to characterize sediment designated for removal (using continuous core and discrete sediment sampling methods). Discrete samples from residual sediment or exposed channel bottom in earthen channels only will be collected in an attempt to characterize the sediment that may be subject to erosion and transport during flows. This plan does not cover water quality sampling during sediment removal operations which will be covered under a separate plan.

The Sediment Characterization Plan addresses the following sampling methods designed to meet the overall objectives of landfill acceptance, sediment reuse at alternative sites, water quality protection, and fish and wildlife protection:

1. Continuous core sediment sampling
2. Discrete sediment sampling
3. Residual sediment sampling

## OBJECTIVES

The specific objectives of the Sediment Characterization Plan are as follows:

1. Characterize the sediments for acceptance by landfills for disposal or reuse.
2. Characterize the sediments to determine their suitability for reuse at alternative disposal sites (i.e., nonlandfill reuse sites).
3. Compliance with regulatory requirements for the Sediment Removal Program, as prescribed in the following documents:
  - C Regional Board WDR's for the District's Multi-Year Sediment Removal Program aimed primarily at water quality protection.
  - C The District and DFG Memorandum of Understanding for Routine Maintenance Activities in Improved Channels aimed primarily at protection of fish and wildlife.
4. Provide data for evaluation of the feasibility of long-term disposal, reuse, and recycling opportunities for sediment generated by the District.
5. Provide a basis for the Self-Monitoring Program to determine whether additional water quality constituents should be monitored.

## **BACKGROUND**

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### **SEDIMENT REMOVAL PROGRAM**

The District proposes to conduct sediment removal activities (dredging) at creek sites. Table 1 outlines the names of creeks by District zones, locations, and approximate amounts of sediment removal proposed over the next ten (10) years.

### **PURPOSE OF SEDIMENT CHARACTERIZATION**

There are four main reasons for characterizing the sediments described as follows:

#### **Landfill Acceptance**

Landfills require materials to be characterized before they accept the same for disposal or reuse at their site. They generally require representative sediment samples analyzed by requiring a select number of discrete samples from a stockpile composited into a single sample for analyses. The approach of sampling a stockpile is difficult, if not impossible, during the District's sediment removal operations. The District has limited project access and area to stockpile material while analytical results are pending. In order to be able to characterize the material, the District must conduct in-situ sampling and composite the samples for analyses. This approach has been acceptable to the landfills under previous Sediment Removal Projects.

#### **Alternative Reuse Sites**

Alternative reuse sites generally consist of contractors using materials for construction. These alternatives are typically time dependant on the contractor's construction schedule. The contractors have been requesting characterization of the materials. The characterization method of constituents varies between contractors, but in general, has been less stringent than the landfills.

#### **The San Francisco Bay Regional Water Quality Control Board**

The Regional Board has required characterization of the materials to determine if the proposed disposal method is acceptable. The Regional Board must ensure that the disposal of the material will not pose a threat to the waters of the state. The Regional Board is interested in determination of total mercury and polychlorinated biphenyls (PCB's) in residual sediment after sediment removal.

#### **The California Department of Fish and Game**

The DFG requests that the materials be characterized to determine if they will adversely impact fish and wildlife. The removal operations may cause sediments to be resuspended and migrate downstream where it may have an impact on fish and wildlife. The DFG is interested in the toxicity of the sediments to fish and wildlife.

**Table 1**  
San Francisco Bay Area Region  
Multi-Year Sediment Removal Sites

Creek	Location	Crk No	Type	Freq (No. of times work to be done in 10 years)	From Sta	To Sta	Length (ft)	Estimated Total Length for 10 year Program (ft)	Avg Vol each time removed (cy)	Estimated Total Vol for 10 year Program (cy)	Ave. Vol./Yr. (cy)
<b>Lower Peninsula Watershed (North West Zone)</b>											
Adobe Creek	Hwy 101 to Lewis	1010	C	4	130+00	170+00	4,000	16,000	4,500	18,000	1,800
	Near El Camino		C	4	220+00	250+00	3,000	12,000	1,700	6,800	680
Baron Creek Debris Basin	Foothill to Miranda	1012	DB	1	159+00	162+00	300	300	5,000	5,000	500
Matadero Creek	Hwy 101 to Rosa	1021	EB,C	6	94+00	140+00	4,600	27,600	2,600	15,600	1,560
Permanente Diversion	Near Grant	1023	C	4	50+00	65+00	1,500	6,000	500	2,000	200
Permanente Creek	Hwy 101 to Charleston	1024	E	4	113+00	126+00	1,300	5,200	1,000	4,000	400
	d/s Portland		C	3	340+00	350+00	1,000	3,000	1,000	3,000	300
San Francisquito Creek	d/s Hwy 101	1029	E	3	70+00	80+00	1,000	3,000	4,500	13,500	1,350
Stevens Creek	Crit. To L'Avenida	1029	E	5	88+00	130+00	4,200	21,000	12,000	60,000	6,000
	near Moffet		C	5	150+00	165+00	1,500	7,500	2,000	10,000	1,000
<b>West Valley Watershed (North Central Zone)</b>											
Calabazas Creek	d/s Hwy 101	2010	E	3	82+00	102+00	2,000	6,000	3,000	9,000	900
	near Pomeroy		C	4	250+00	252+00	200	800	200	800	80
	near Georgetown		C	4	194+00	196+00	200	800	200	800	80
	Comer Debris Basin		DB	3	599+00	605+00	600	1,800	800	2,400	240
Junipero Serra Channel	to Blaney	2013	E	1	0000	60+00	6,000	6,000	1,000	1,000	100
Regnart Creek	near Kim	2017	E	5	80+00	85+00	500	2,500	200	1,000	100
Rodeo Creek	Dandridge	2018	C	3	3+00	4+50	150	450	500	1,500	150
	Rainbow		C	3	12+00	13+00	100	300	50	150	15
	Dartmore		C	3	27+00	28+00	100	300	50	150	15
San Tomas Aquino Creek	d/s Monroe	2019	E,C	3	0000	225+00	22,500	67,500	30,000	90,000	9,000

C: Concrete

E: Earth

CB: Concrete Bottoms

EC: Excavated Channel

DB: Debris Basin

LF: Low Flow



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Creek	Location		Crk No	Type	Freq (No. of times work to be done in 10 years)	From Sta	To Sta	Length (ft)	Estimated Total Length for 10 year Program (ft)	Avg Vol each time removed (cy)	Estimated Total Vol for 10 year Program (cy)
	Westmont Debris Basin		DB	3	637+00	642+00	500	1,500	5,500	16,500	1,650
Saratoga Creek	to Warburton	2021	E	5	0000	34+00	3,400	17,000	6,000	30,000	3,000
	near Lawrence, Hwy 280		E	1	170+00	200+00	3,000	3,000	5,000	5,000	500
	Prospect		C	1	304+00	306+00	200	200	500	500	50
Smith Creek	to Elam	2023	C,E	1	0000	17+00	1,700	1,700	200	200	20
Sunnyvale East Channel	to Hwy 101	2026	E	4	0000	110+00	11,000	44,000	8,000	32,000	3,200
Sunnyvale West Channel	Carl to Hwy 101	2027	E	2	50+00	134+00	8,400	16,800	4,500	9,000	900
El Camino Storm Drain	to Monroe	2037	C	1	0000	52+00	5,200	5,200	1,200	1,200	120
<b>Guadalupe Watershed (Central Zone)</b>											
Canoas Creek	All	3011	CB	4	0000	390+00	39,000	156,000	12,000	48,000	4,800
Greystone Creek	to Almaden	3014	E	1	0000	21+00	2,100	2,100	5,000	5,000	500
Guadalupe River	d/s Montague	3015	EC	6	315+00	390+00	7,500	45,000	10,000	60,000	6,000
	d/s Trimble		E	3	390+00	450+00	6,000	18,000	8,000	24,000	2,400
	St. John St.		C	4	663+00	670+00	700	2,800	2,500	10,000	1,000
Ross Creek	Cherry	3023	C	5	27+00	28+50	150	750	200	1,000	100
	Jarvis		C	5	43+00	44+00	100	500	200	1,000	100
	u/s Jarvis		C	5	47+00	50+00	300	1,500	200	1,000	100
	Meridian		C	5	71+00	72+00	100	500	200	1,000	100
	d/s Leigh		C	5	151+00	153+00	200	1,000	200	1,000	100
	d/s Union		C	5	178+00	181+00	300	1,500	200	1,000	100
	Los Gatos Almaden		C	5	204+00	205+00	100	500	200	1,000	100
	Almaden Valley Pipeline		C	5	222+00	223+25	125	625	200	1,000	100

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Creek	Location	Crk No	Type	Freq (No. of times work to be done in 10 years)	From Sta	To Sta	Length (ft)	Estimated Total Length for 10 year Program (ft)	Avg Vol each time removed (cy)	Estimated Total Vol for 10 year Program (cy)	Ave. Vol./Yr. (cy)
Guadalupe Creek	at Camden Road	3026	E	3	1165+00	1170+00	500	1,500	500	1,500	150
Randol Creek	Rajkovitch to u/s Viewpoint	3029	E	1	45+00	80+00	3,500	3,500	3,000	3,000	300
<b>Coyote Watershed (East Zone)</b>											
Berryessa Creek	to Los Coches Creek	4017	E	5	0000	93+50	9,350	46,750	15,000	75,000	7,500
	Los Coches to Montague		E	3	93+50	165+00	7,150	21,450	3,500	10,500	1,050
	Cropley to Morrill		E	3	230+00	234+00	400	1,200	1,500	4,500	450
	d/s Piedmont		E	3	284+00	298+00	1,400	4,200	2,500	7,500	750
Calera Creek	to Drop Structure	4018	E	4	0000	31+00	3,100	12,400	1,500	6,000	600
	to Russell Lane		E	2	31+00	48+00	1,700	3,400	1,500	3,000	300
Fisher Creek	Leguna	4023	E	1	145+00	155+00	1,000	1,000	1,000	1,000	100
Los Coches Creek	to u/s Hwy 680	4025	E	3	0000	24+00	2,400	7,200	1,000	3,000	300
Lower Silver Creek	d/s McKee	4026	E	5	38+00	52+00	1,400	7,000	1,500	7,500	750
	u/s Alum Rock		C	3	88+00	100+00	1,200	3,600	600	1,800	180
	Jackson to Capital		E	1	128+00	155+00	2,700	2,700	1,500	1,500	150
	u/s No. Babb		E	1	168+00	173+00	500	500	500	500	50
	d/s Martha Street		E	3	200+00	205+00	500	1,500	500	1,500	150
	Cunningham to Quimby		E	3	245+00	315+00	7,000	21,000	10,000	30,000	3,000
	King to Pipe		E	2	367+00	377+50	1,050	2,100	1,000	2,000	200
Miguelita Creek	Lochridge to Educational Park Drive	4029	E	3	10+00	25+00	1,500	4,500	1,000	3,000	300
	d/s Jackson to Jackson		E	3	37+00	44+00	700	2,100	500	1,500	150
Upper Penitencia Crk	King	4032	E	2	35+00	38+00	300	600	300	600	60
	Maybury		E	2	55+00	57+00	200	400	200	400	40
	near Maybury		E	2	71+00	72+00	100	200	100	200	20
Lower Penitencia Crk	to CA Circle	4033	E,C	8	0000	50+00	5,000	40,000	5,000	40,000	4,000

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DB: Debris Basin

LF: Low Flow

**Table 1**  
San Francisco Bay Area Region  
Multi-Year Sediment Removal Sites

Creek	Location	Crk No	Type	Freq (No. of times work to be done in 10 years)	From Sta	To Sta	Length (ft)	Estimated Total Length for 10 year Program (ft)	Avg Vol each time removed (cy)	Estimated Total Vol for 10 year Program (cy)	Ave. Vol/Yr. (cy)
	Calavaras to d/s Hetch Hetchy	E,C	4	112+00	140+00	2,800	11,200	2,500	10,000	1,000	
Sierra Creek	Berryessa to Mauna Kea	4037	E	3	0000	72+00	7,200	21,600	2,500	7,500	750
Upper Silver Creek	to Hwy 101	4038	C	2	0000	35+00	3,500	7,000	1,000	2,000	200
Tularcitos Creek	to Hwy 680	4040	E	2	0000	38+00	3,800	7,600	3,500	7,000	700
Norwood Creek	to White Road	4042	E	2	0000	32+00	3,200	6,400	1,800	3,600	360
Thompson Creek	u/s Quimby	4047	E	1	0000	20+00	2,000	2,000	1,000	1,000	100
<b>TOTAL</b>						219,975	752,825			73,070	

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## SAMPLING METHODS

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This section describes the frequency of sampling and the location of sample collection at the Sediment Removal Program sites for both the sediment designated for removal and the residual sediment. From both the regulatory and scientific perspectives, the primary objectives of a sampling plan for a solid material are twofold: namely, (1) to collect samples that are representative samples as exhibiting average properties of the whole solid material and (2) to collect samples that will allow measurements of the chemical properties of the waste that are both accurate and precise.

### SAMPLING OF SEDIMENT DESIGNATED FOR REMOVAL

Continuous core and discrete sediment samples will be collected for characterization of sediment designated for removal.

#### **Sampling of Continuous Core Sediment Samples**

The District plans to collect continuous core sediment samples at selected locations (e.g., at outfalls, sediment deposition areas). The purpose of continuous core sediment sampling will be to establish a basis for the water quality sampling and monitoring effort during dredging operations. Each continuous core sample will be composited for analyses.

##### *Continuous Core Sample Collection Frequency*

The number of continuous core sampling locations for all creeks is one sample per 4,000 cy of sediment to be removed. All continuous core samples will be analyzed for total metals (EPA 6010 and 7000 series), pesticides (EPA 8081), PAH (EPA 8310), and toxicity screening (tidal sites only) (Corps' method for Eohaustorius Estaurius). Only one continuous core sample that best meets specified sampling criteria at each creek site will be analyzed using all tests listed in Table 4 to maintain consistency with past data. If multiple samples are collected, other samples at the creek site will be tested for the four analytes identified as above (metals, pesticides, PAH, and toxicity). Table 2A presents the following information: the sediment removal sites, the approximate location of the sites, the length of work area by stations of the upstream and downstream limits of the sites, the type of site (tidal/nontidal, lining type), the estimated average annual volume of sediment generated at each site, and the average number of sampling locations at each site.

##### *Continuous Core Sample Locations*

The continuous core sampling locations are locations that have the potential for detecting maximum number of contaminants, at highest concentrations within the creek. Such sampling locations shall be determined based on criteria such as known locations of outfalls, storm water runoff locations, and by visually identifying potential sediment deposition areas and industrial sources along the stream stretches where dredging is planned. In this regard, the District will identify the continuous core sampling locations that best meet these criteria, possibly with the DFG and/or Regional Board during a field visit. At each creek site, a minimum of one continuous core sediment sample will be collected at location that best meets the above specified criteria.

#### **Sampling of Discrete Sediment Samples**

The proposed sampling approach is consistent with the EPA protocol described under SW-846, "Test Methods for Evaluating Solid Waste."

Reliable information concerning the chemical properties of a solid waste is needed for the purpose of comparing chemical properties with applicable regulatory thresholds. For chemical information to be reliable, it must be accurate and precise. Accuracy is usually achieved by incorporating some form of randomness into the selection process for the samples that generate the data. Precision is most often obtained by selecting an appropriate number of samples.

For the Sediment Sampling Program, the District proposes to utilize a systematic random sampling technique, in which the first unit to be collected from a population is randomly selected, but all subsequent units are taken at fixed space intervals. For example, if a sample has to be collected every 1,000 feet from a stream 10,000-foot long, only the first sample will be collected at a random location (0 to 1,000 feet). The second sample will be spaced 1,000 feet from the first one and so on until all ten samples are collected. The advantages of systematic random sampling over other sampling techniques are the ease with which samples are identified, and collected, an increase in precision, and to collect representative data on chemical properties.

#### *Discrete Sample Collection Frequency*

In order to characterize the sediment, one composite in-situ sample shall be collected and analyzed approximately every 4,000 cy. Approximately one sample shall be collected every 1,000 cy. These samples will be composited together by the laboratory. Up to four (4) samples shall be composited together, and analysis shall be performed on the composite samples. For example, if 30,000 cy of sediment is to be removed along a single creek, 30 samples shall be collected and composited in the laboratory into eight (8) samples (seven 4-point composite samples and one 2-point composite sample). Analysis shall then be performed on the eight (8) composite samples. Each sample shall be analyzed for multiple constituents (see Analytical Procedures).

Table 2B presents the following information: the sediment removal sites, the approximate location of the sites, the length of work area by stations of the upstream and downstream limits of the sites, the type of site (tidal/nontidal, lining type), the average annual estimated volume of sediment generated at each site, and the average number of sampling locations at each site.

#### *Discrete Sample Locations*

The location of each sample at the Sediment Removal Program sites must be selected in the following three dimensions: (1) the creek station, or the location along the length of the creek; (2) the location along the creek cross section; and (3) the depth below ground surface (bgs). The rationale for selection of a sampling location in all three dimensions is described below:

#### *Location Along the Creek Length (Station)*

Samples shall be collected at regular intervals along the length of the creek. The sampling interval shall be determined by dividing the length of the creek reach by the number of samples to be collected. For example, if it is desired to collect five samples along a 1.8-mile reach of a creek, divide the creek length (1.8 miles), by the number of samples (five) to be collected ( $1.8 \text{ miles} / 5 = 0.36 \text{ mile}$ ). Therefore, one sample shall be collected about every 0.36 mile or approximately one sample every 1,900 feet.

The initial sampling location along a creek reach shall be selected by generating a random number (X) within the sampling interval, and the initial sample shall be collected X feet upstream (or downstream) of the upstream (or downstream) end of the reach. For example, if the sampling interval is to be 1,900 feet, a random number shall be generated between 0 and 1,900. The first sampling location shall be approximately X feet from either the upstream or downstream end of the reach. Subsequent samples shall be located at approximately  $X+1,900$  feet;  $X+2(1,900)$  feet; etc., from the start or end of the creek reach.

Sampling intervals may be determined by estimating distances on a map.

In the event that there is no sediment in the creek at the designated sampling interval, sampling staff shall proceed either upstream or downstream until a sediment deposition is found in the creek, and the sample shall be collected at that location.

#### *Location Along the Creek Cross Section*

The sampling location along the cross section shall be chosen by dividing the creek invert into thirds. A random number generator table (Appendix A) shall be used to generate a number between one and three at each cross section. If the random number selected is one, the sample will be collected from the left third (looking upstream) of the cross section; if the random number selected is two, the sample will be collected from the center third; and if the random number selected is three, the sample will be collected from the right third (looking upstream).

For example, if the width of section of creek where sediment is to be removed from is 12 feet across, the creek section shall be divided into three 4-foot-wide sections. Using Appendix A, the random number of three is selected, and the sample will be collected from the right 4-foot section of the creek.

A sample exercise for selecting sample locations is presented under Appendix B.

**Table 2A**  
San Francisco Bay Area Region  
Multi-Year Sediment Removal Sites  
Sampling Locations and Frequency  
(Average Annual Continuous Core Sediment Sampling)

Creek	Location	Length of Work Area		Type of Site	Tidal/Non-Tidal	Estimated Annual Sediment Volume (cy)	Average Number of Samples
		Beg. Sta. (ft)	End Sta. (ft)				
Lower Peninsula Watershed (NorthWest Zone)							
Adobe Creek	Hwy 101 to Lewis	130+00	170+00	C	Non-Tidal	1,800	2
	Near El Camino	220+00	250+00	C	Non-Tidal	680	1
Baron Creek Debris Basin	Foothill to Miranda	159+00	162+00	E	Non-Tidal	500	2
Matadero Creek	Hwy 101 to Rosa	94+00	140+00	EB,C	Non-Tidal	1,560	1
Permanente Diversion	Near Grant	50+00	65+00	C	Non-Tidal	200	1
Permanente Creek	Hwy 101 to Charleston	113+00	126+00	E	Non-Tidal	400	1
	d/s Portland	340+00	350+00	C	Non-Tidal	300	1
San Francisquito Creek	d/s Hwy 101	70+00	80+00	E	Tidal	1,350	2
Stevens Creek	Crit. To L'Avenida	88+00	130+00	E	Tidal/Non-Tidal	6,000	3
	near Moffet	150+00	165+00	C	Non-Tidal	1,000	1
West Valley Watershed (North Central Zone)							
Calabazas Creek	d/s Hwy 101	82+00	102+00	E	Non-Tidal	900	1
	near Pomeroy	250+00	252+00	C	Non-Tidal	80	1
	near Georgetown	194+00	196+00	C	Non-Tidal	80	1
	Comer Debris Basin	599+00	605+00	E	Non-Tidal	240	1
Junipero Serra Channel	to Blaney	0000	60+00	E	Non-Tidal	100	1
Regnart Creek	near Kim	80+00	85+00	E	Non-Tidal	100	1
Rodeo Creek	Dandridge	3+00	4+50	C	Non-Tidal	150	1
	Rainbow	12+00	13+00	C	Non-Tidal	15	1
	Dartmore	27+00	28+00	C	Non-Tidal	15	1

**Table 2A**  
San Francisco Bay Area Region  
Multi-Year Sediment Removal Sites  
Sampling Locations and Frequency  
(Average Annual Continuous Core Sediment Sampling)

Creek	Location	Length of Work Area		Type of Site	Tidal/Non-Tidal	Estimated Annual Sediment Volume (cy)	Average Number of Samples
		Beg. Sta. (ft)	End Sta. (ft)				
	Westmont Debris Basin	637+00	642+00	E	Non-Tidal	1,650	2
Saratoga Creek	to Warburton	0	34+00	E	Non-Tidal	3,000	2
	near Lawrence, Hwy 280	170+00	200+00	E	Non-Tidal	500	2
	Prospect	304+00	306+00	C	Non-Tidal	50	1
Smith Creek	to Elam	0000	17+00	C,E	Non-Tidal	20	1
Sunnyvale East Channel	to Hwy 101	0000	110+00	E	Tidal/Non-Tidal	3,200	2
Sunnyvale West Channel	Carl to Hwy 101	50+00	134+00	E	Tidal/Non-Tidal	900	2
El Camino Storm Drain	to Monroe	0000	52+00	C	Non-Tidal	120	1
<b>Guadalupe Watershed (Central Zone)</b>							
Canoas Creek	All	0000	390+00	CB	Non-Tidal	4,800	3
Greystone Creek	to Almaden	0000	21+00	E	Non-Tidal	500	2
Guadalupe River	d/s Montague	315+00	390+00	EC	Tidal	6,000	3
	d/s Trimble	390+00	450+00	E	Non-Tidal	2,400	2
	St. John St.	663+00	670+00	C	Non-Tidal	1,000	1
Ross Creek	Cherry	27+00	28+50	C	Non-Tidal	100	1
	Jarvis	43+00	44+00	C	Non-Tidal	100	1
	u/s Jarvis	47+00	50+00	C	Non-Tidal	100	1
	Meridian	71+00	72+00	C	Non-Tidal	100	1
	d/s Leigh	151+00	153+00	C	Non-Tidal	100	1
	d/s Union	178+00	181+00	C	Non-Tidal	100	1



**Table 2A**  
San Francisco Bay Area Region  
Multi-Year Sediment Removal Sites  
Sampling Locations and Frequency  
(Average Annual Continuous Core Sediment Sampling)

Creek	Location	Length of Work Area		Type of Site	Tidal/Non-Tidal	Estimated Annual Sediment Volume (cy)	Average Number of Samples
		Beg. Sta. (ft)	End Sta. (ft)				
Randol Creek	Rajkovitch to u/s Viewpoint	45+00	80+00	E	Non-Tidal	300	1
<b>Coyote Watershed (East Zone)</b>							
Berryessa Creek	to Los Coches Creek	0000	93+50	E	Tidal	7,500	4
	Los Coches to Montague	93+50	165+00	E	Non-Tidal	1,050	1
	Cropley to Morrill	230+00	234+00	E	Non-Tidal	450	1
	d/s Piedmont	284+00	298+00	E	Non-Tidal	750	1
Calera Creek	to Drop Structure	0000	31+00	E	Non-Tidal	600	1
	to Russell Lane	31+00	48+00	E	Non-Tidal	300	1
Fisher Creek	Leguna	145+00	155+00	E	Non-Tidal	100	1
Los Coches Creek	to u/s Hwy 680	0000	24+00	E	Non-Tidal	300	1
Lower Silver Creek	d/s McKee	38+00	52+00	E	Non-Tidal	750	1
	u/s Alum Rock	88+00	100+00	C	Non-Tidal	180	1
	Jackson to Capital	128+00	155+00	E	Non-Tidal	150	1
	u/s No. Babb	168+00	173+00	E	Non-Tidal	50	1
	d/s Martha Street	200+00	205+00	E	Non-Tidal	150	1
	Cunningham to Quimby	245+00	315+00	E	Non-Tidal	3,000	3
	King to Pipe	367+00	377+50	E	Non-Tidal	200	1
Miguelita Creek	Lochridge to Educational Park Dr.	10+00	25+00	E	Non-Tidal	300	1
	d/s Jackson to Jackson	37+00	44+00	E	Non-Tidal	150	1
Upper Penitencia Crk	King	35+00	38+00	E	Non-Tidal	60	1
	Maybury	55+00	57+00	E	Non-Tidal	40	1

**Table 2A**  
San Francisco Bay Area Region  
Multi-Year Sediment Removal Sites  
Sampling Locations and Frequency  
(Average Annual Continuous Core Sediment Sampling)

Creek	Location	Length of Work Area		Type of Site	Tidal/Non-Tidal	Estimated Annual Sediment Volume (cy)	Average Number of Samples
		Beg. Sta. (ft)	End Sta. (ft)				
Lower Penitencia Crk	to CA Circle	0000	50+00	E,C	Tidal	4,000	2
	Calavaras to d/s Hetch Hetchy	112+00	140+00	E,C	Non-Tidal	1,000	1
Sierra Creek	Berryessa to Mauna Kea	0000	72+00	E	Non-Tidal	750	1
Upper Silver Creek	to Hwy 101	0000	35+00	C	Non-Tidal	200	1
Tularcitos Creek	to Hwy 680	0000	38+00	E	Non-Tidal	700	1
Norwood Creek	to White Road	0000	32+00	E	Non-Tidal	360	1
Thompson Creek	u/s Quimby	0000	20+00	E	Non-Tidal	100	1
<b>TOTAL</b>						73,070	99
<div style="display: flex; justify-content: space-between; padding: 5px;"> <span>C: Concrete</span> <span>CB: Concrete Bottom</span> <span>DB: Debris Basin</span> </div> <div style="display: flex; justify-content: space-between; padding: 5px;"> <span>E: Earth</span> <span>EC: Excavated Channel</span> <span>LF: Low Flow</span> </div>							

**Table 2B**  
San Francisco Bay Area Region  
Multi-Year Sediment Removal Sites  
Sampling Locations and Frequency  
(Average Annual Discrete Sediment Sampling)

Creek	Location	Length of Work Area		Type of Site	Tidal / Non-Tidal	Estimated Annual Sediment Volume (cy)	Average Number of Samples	Average Number of Composite Samples
		Beg. Sta. (ft)	End Sta. (ft)					
Lower Peninsula Watershed (NorthWest Zone)								
Adobe Creek	Hwy 101 to Lewis	130+00	170+00	C	Non-Tidal	1,800	5	2
	Near El Camino	220+00	250+00	C	Non-Tidal	680	2	1
Baron Creek Debris Basin	Foothill to Miranda	159+00	162+00	E	Non-Tidal	500	5	2
Matadero Creek	Hwy 101 to Rosa	94+00	140+00	EB,C	Non-Tidal	1,560	3	1
Permanente Diversion	Near Grant	50+00	65+00	C	Non-Tidal	200	1	1
Permanente Creek	Hwy 101 to Charleston	113+00	126+00	E	Non-Tidal	400	1	1
	d/s Portland	340+00	350+00	C	Non-Tidal	300	1	1
San Francisquito Creek	d/s Hwy 101	70+00	80+00	E	Tidal	1,350	5	2
Stevens Creek	Crit. To L'Avenida	88+00	130+00	E	Tidal/Non-Tidal	6,000	12	3
	near Moffet	150+00	165+00	C	Non-Tidal	1,000	2	1
West Valley Watershed (North Central Zone)								
Calabazas Creek	d/s Hwy 101	82+00	102+00	E	Non-Tidal	900	3	1
	near Pomeroy	250+00	252+00	C	Non-Tidal	80	1	1
	near Georgetown	194+00	196+00	C	Non-Tidal	80	1	1
	Comer Debris Basin	599+00	605+00	E	Non-Tidal	240	1	1
Junipero Serra Channel	to Blaney	0000	60+00	E	Non-Tidal	100	1	1
Regnart Creek	near Kim	80+00	85+00	E	Non-Tidal	100	1	1
Rodeo Creek	Dandridge	3+00	4+50	C	Non-Tidal	150	1	1
	Rainbow	12+00	13+00	C	Non-Tidal	15	1	1
	Dartmore	27+00	28+00	C	Non-Tidal	15	1	1
San Tomas Aquino Creek	d/s Monroe	0000	225+00	E,C	Tidal/Non-Tidal	9,000	30	8
	Westmont Debris Basin	637+00	642+00	E	Non-Tidal	1,650	6	2
Saratoga Creek	to Warburton	0000	34+00	E	Non-Tidal	3,000	6	2
	near Lawrence, Hwy 280	170+00	200+00	E	Non-Tidal	500	5	2
	Prospect	304+00	306+00	C	Non-Tidal	50	1	1
Smith Creek	to Elam	0000	17+00	C,E	Non-Tidal	20	1	1

**Table 2B**  
San Francisco Bay Area Region  
Multi-Year Sediment Removal Sites  
Sampling Locations and Frequency  
(Average Annual Discrete Sediment Sampling)

Creek	Location	Length of Work Area		Type of Site	Tidal / Non-Tidal	Estimated Annual Sediment Volume (cy)	Average Number of Samples	Average Number of Composite Samples
		Beg. Sta. (ft)	End Sta. (ft)					
Sunnyvale East Channel	to Hwy 101	0000	110+00	E	Tidal/Non-Tidal	3,200	8	2
Sunnyvale West Channel	Carl to Hwy 101	50+00	134+00	E	Tidal/Non-Tidal	900	5	2
El Camino Storm Drain	to Monroe	0000	52+00	C	Non-Tidal	120	2	1
<b>Guadalupe Watershed (Central Zone)</b>								
Canoas Creek	All	0000	390+00	C	Non-Tidal	4,800	12	3
Greystone Creek	to Almaden	0000	21+00	E	Non-Tidal	500	5	2
Guadalupe River	d/s Montague	315+00	390+00	EC	Tidal	6,000	10	3
	d/s Trimble	390+00	450+00	E	Non-Tidal	2,400	8	2
	St. John St.	663+00	670+00	C	Non-Tidal	1,000	3	1
Ross Creek	Cherry	27+00	28+50	C	Non-Tidal	100	1	1
	Jarvis	43+00	44+00	C	Non-Tidal	100	1	1
	u/s Jarvis	47+00	50+00	C	Non-Tidal	100	1	1
	Meridian	71+00	72+00	C	Non-Tidal	100	1	1
	d/s Leigh	151+00	153+00	C	Non-Tidal	100	1	1
	d/s Union	178+00	181+00	C	Non-Tidal	100	1	1
	Los Gatos Almaden	204+00	205+00	C	Non-Tidal	100	1	1
	Almaden Valley Pipeline	222+00	223+25	C	Non-Tidal	100	1	1
Guadalupe Creek	at Camden Road	1165+00	1170+00	E	Non-Tidal	150	1	1
Randol Creek	Rajkovitch to u/s Viewpoint	45+00	80+00	E	Non-Tidal	300	3	1
<b>Coyote Watershed (East Zone)</b>								
Berryessa Creek	to Los Coches Creek	0000	93+50	E	Tidal	7,500	15	4
	Los Coches to Montague	93+50	165+00	E	Non-Tidal	1,050	4	1
Calera Creek	to Drop Structure	0000	31+00	E	Non-Tidal	600	2	1
	to Russell Lane	31+00	48+00	E	Non-Tidal	300	2	1
Fisher Creek	Leguna	145+00	155+00	E	Non-Tidal	100	1	1
Los Coches Creek	to u/s Hwy 680	0000	24+00	E	Non-Tidal	300	1	1
Lower Silver Creek	d/s McKee	38+00	52+00	E	Non-Tidal	750	2	1

**Table 2B**  
San Francisco Bay Area Region  
Multi-Year Sediment Removal Sites  
Sampling Locations and Frequency  
(Average Annual Discrete Sediment Sampling)

Creek	Location	Length of Work Area		Type of Site	Tidal / Non-Tidal	Estimated Annual Sediment Volume (cy)	Average Number of Samples	Average Number of Composite Samples
		Beg. Sta. (ft)	End Sta. (ft)					
	u/s Alum Rock	88+00	100+00	C	Non-Tidal	180	1	1
	Jackson to Capital	128+00	155+00	E	Non-Tidal	150	2	1
	u/s No. Babb	168+00	173+00	E	Non-Tidal	50	1	1
	d/s Martha Street	200+00	205+00	E	Non-Tidal	150	1	1
	Cropley to Morrill	230+00	234+00	E	Non-Tidal	450	2	1
	d/s Piedmont	284+00	298+00	E	Non-Tidal	750	3	1
	Cunningham to Quimby	245+00	315+00	E	Non-Tidal	3,000	10	3
	King to Pipe	367+00	377+50	E	Non-Tidal	200	1	1
Miguelita Creek	Lochridge to Educational Park Dr.	10+00	25+00	E	Non-Tidal	300	1	1
	d/s Jackson to Jackson	37+00	44+00	E	Non-Tidal	150	1	1
Upper Penitencia Crk	King	35+00	38+00	E	Non-Tidal	60	1	1
	Maybury	55+00	57+00	E	Non-Tidal	40	1	1
	near Maybury	71+00	72+00	E	Non-Tidal	20	1	1
Lower Penitencia Crk	to CA Circle	0000	50+00	E,C	Tidal	4,000	5	2
	Calavaras to d/s Hetch Hetchy	112+00	140+00	E,C	Non-Tidal	1,000	3	1
Sierra Creek	Berryessa to Mauna Kea	0000	72+00	E	Non-Tidal	750	3	1
Upper Silver Creek	to Hwy 101	0000	35+00	C	Non-Tidal	200	1	1
Tularcitos Creek	to Hwy 680	0000	38+00	E	Non-Tidal	700	4	1
Norwood Creek	to White Road	0000	32+00	E	Non-Tidal	360	2	1
Thompson Creek	u/s Quimby	0000	20+00	E	Non-Tidal	100	1	1
<b>TOTAL</b>						73,070	234	99
C: Concrete                      CB: Concrete Bottom                      DB: Debris Basin E: Earth                              EC: Excavated Channel                      LF: Low Flow								

**Table 2C**  
Multi-Year Sediment Removal Sites  
Sampling Locations and Frequency  
(Average Annual Residual Sediment Sampling)

Creek	Location	Length of Work Area		Type of Site	Tidal / Non-Tidal	Estimated Annual Sediment Volume (cy)	Average Number of Samples
		Beg. Sta. (ft)	End Sta. (ft)				
Lower Peninsula Watershed (NorthWest Zone)							
Adobe Creek	Hwy 101 to Lewis	130+00	170+00	C	Non-Tidal	1,800	0
	Near El Camino	220+00	250+00	C	Non-Tidal	680	0
Baron Creek Debris Basin	Foothill to Miranda	159+00	162+00	E	Non-Tidal	500	2
Matadero Creek	Hwy 101 to Rosa	94+00	140+00	C	Non-Tidal	1,560	0
Permanente Diversion	Near Grant	50+00	65+00	C	Non-Tidal	200	0
Permanente Creek	Hwy 101 to Charleston	113+00	126+00	E	Non-Tidal	400	1
	d/s Portland	340+00	350+00	C	Non-Tidal	300	0
San Francisquito Creek	d/s Hwy 101	70+00	80+00	E	Tidal	1,350	2
Stevens Creek	Crit. To L'Avenida	88+00	130+00	E	Tidal/Non-Tidal	6,000	3
	near Moffet	150+00	165+00	C	Non-Tidal	1,000	0
West Valley Watershed (North Central Zone)							
Calabazas Creek	d/s Hwy 101	82+00	102+00	E	Non-Tidal	900	1
	near Pomeroy	250+00	252+00	C	Non-Tidal	80	0
	near Georgetown	194+00	196+00	C	Non-Tidal	80	0
	Comer Debris Basin	599+00	605+00	E	Non-Tidal	240	1
Junipero Serra Channel	to Blaney	0000	60+00	E	Non-Tidal	100	1
Regnart Creek	near Kim	80+00	85+00	E	Non-Tidal	100	1
Rodeo Creek	Dandridge	3+00	4+50	C	Non-Tidal	150	0
	Rainbow	12+00	13+00	C	Non-Tidal	15	0
	Dartmore	27+00	28+00	C	Non-Tidal	15	0
San Tomas Aquino Creek	d/s Monroe	0000	225+00	E,C	Tidal/Non-Tidal	9,000	4
	Westmont Debris Basin	637+00	642+00	E	Non-Tidal	1,650	2
Saratoga Creek	to Warburton	0000	34+00	E	Non-Tidal	3,000	2
	near Lawrence, Hwy 280	170+00	200+00	E	Non-Tidal	500	2
	Prospect	304+00	306+00	C	Non-Tidal	50	0
Smith Creek	to Elam	0000	17+00	C,E	Non-Tidal	20	1
Sunnyvale East Channel	to Hwy 101	0000	110+00	E	Tidal/Non-Tidal	3,200	2
Sunnyvale West Channel	Carl to Hwy 101	50+00	134+00	E	Tidal/Non-Tidal	900	2
El Camino Storm Drain	to Monroe	0000	52+00	C	Non-Tidal	120	0
Guadalupe Watershed (Central Zone)							

**Table 2C**  
Multi-Year Sediment Removal Sites  
Sampling Locations and Frequency  
(Average Annual Residual Sediment Sampling)

Creek	Location	Length of Work Area		Type of Site	Tidal / Non-Tidal	Estimated Annual Sediment Volume (cy)	Average Number of Samples
		Beg. Sta. (ft)	End Sta. (ft)				
Canoas Creek	All	0000	390+00	C	Non-Tidal	4,800	0
Greystone Creek	to Almaden	0000	21+00	E	Non-Tidal	500	2
Guadalupe River	d/s Montague	315+00	390+00	EC	Tidal	6,000	3
	d/s Trimble	390+00	450+00	E	Non-Tidal	2,400	2
	St. John St.	663+00	670+00	C	Non-Tidal	1,000	0
Ross Creek	Cherry	27+00	28+50	C	Non-Tidal	100	0
	Jarvis	43+00	44+00	C	Non-Tidal	100	0
	u/s Jarvis	47+00	50+00	C	Non-Tidal	100	0
	Meridian	71+00	72+00	C	Non-Tidal	100	0
	d/s Leigh	151+00	153+00	C	Non-Tidal	100	0
	d/s Union	178+00	181+00	C	Non-Tidal	100	0
	Los Gatos Almaden	204+00	205+00	C	Non-Tidal	100	0
	Almaden Valley Pipeline	222+00	223+25	C	Non-Tidal	100	0
Guadalupe Creek	at Camden Road	1165+00	1170+00	E	Non-Tidal	150	1
Randol Creek	Rajkovitch to u/s Viewpoint	45+00	80+00	E	Non-Tidal	300	1
<b>Coyote Watershed (East Zone)</b>							
Berryessa Creek	to Los Coches Creek	0000	93+50	E	Tidal	7,500	4
	Los Coches to Montague	93+50	165+00	E	Non-Tidal	1,050	1
	Cropley to Morrill	230+00	234+00	E	Non-Tidal	450	1
	d/s Piedmont	284+00	298+00	E	Non-Tidal	750	1
Calera Creek	to Drop Structure	0000	31+00	E	Non-Tidal	600	1
	to Russell Lane	31+00	48+00	E	Non-Tidal	300	1
Fisher Creek	Leguna	145+00	155+00	E	Non-Tidal	100	1
Los Coches Creek	to u/s Hwy 680	0000	24+00	E	Non-Tidal	300	1
Lower Silver Creek	d/s McKee	38+00	52+00	E	Non-Tidal	750	1
	u/s Alum Rock	88+00	100+00	C	Non-Tidal	180	0
	Jackson to Capital	128+00	155+00	E	Non-Tidal	150	1
	u/s No. Babb	168+00	173+00	E	Non-Tidal	50	1
	d/s Martha Street	200+00	205+00	E	Non-Tidal	150	1
	Cunningham to Quimby	245+00	315+00	E	Non-Tidal	3,000	3
	King to Pipe	367+00	377+50	E	Non-Tidal	200	1
Miguelita Creek	Lochridge to Educational Park Dr.	10+00	25+00	E	Non-Tidal	300	1
	d/s Jackson to Jackson	37+00	44+00	E	Non-Tidal	150	1

**Table 2C**  
Multi-Year Sediment Removal Sites  
Sampling Locations and Frequency  
(Average Annual Residual Sediment Sampling)

Creek	Location	Length of Work Area		Type of Site	Tidal / Non-Tidal	Estimated Annual Sediment Volume (cy)	Average Number of Samples
		Beg. Sta. (ft)	End Sta. (ft)				
Upper Penitencia Crk	King	35+00	38+00	E	Non-Tidal	60	1
	Maybury	55+00	57+00	E	Non-Tidal	40	1
	near Maybury	71+00	72+00	E	Non-Tidal	20	1
Lower Penitencia Crk	to CA Circle	0000	50+00	E,C	Tidal	4,000	2
	Calavaras to d/s Hetch Hetchy	112+00	140+00	E,C	Non-Tidal	1,000	1
Sierra Creek	Berryessa to Mauna Kea	0000	72+00	E	Non-Tidal	750	1
Upper Silver Creek	to Hwy 101	0000	35+00	C	Non-Tidal	200	0
Tularcitos Creek	to Hwy 680	0000	38+00	E	Non-Tidal	700	1
Norwood Creek	to White Road	0000	32+00	E	Non-Tidal	360	1
Thompson Creek	u/s Quimby	0000	20+00	E	Non-Tidal	100	1
<b>TOTAL</b>						<b>73,070</b>	<b>67</b>
C: Concrete E: Earth CB: Concrete Bottom EC: Excavated Channel DB: Debris Basin LF: Low Flow							



### *Sample Depth*

The sampling depth will be determined in the field. At each sampling location, the staff collecting the samples shall make an estimate of the depth of the sediment using visual clues and/or existing data. Once the depth has been estimated, random number generator tables (see Appendix A) shall be used to determine the depth at which the samples shall be collected. Samples shall be collected at the ground surface and at even 1-foot intervals below the ground surface.

For example, if at a given sampling location, visual observations and data provided by the District's Operations and Maintenance staff indicates that the sediment depth is 3 feet, using random number generator tables in Appendix A, a random number shall be selected between the range of zero and three. If the random number selected is zero, then the sample shall be collected at 0 feet bgs (at the ground surface).

In the event that the depth of the sediment is less than 1 foot, then the sample shall be collected at the surface.

Samples will be collected up to a maximum depth of 4 feet bgs, because collection of samples below that depth is prohibitively difficult due to the finite strength of the individual collecting the sample, and the wet properties of the sediment, which may cause a borehole to collapse.

In some locations it may even be infeasible to collect a sample at 3 or 4 feet bgs due to the wet, unstable nature of the sediments. In the event that it is infeasible to collect a sample at the depth interval specified, the sample shall be collected at the deepest interval possible (using 1-foot increments).

The selection of sampling locations is illustrated in Appendix B.

### *Discrete Sample Compositing*

Samples shall be composited by the laboratory into 4-point composite samples. Compositing of samples will be performed in the laboratory by a qualified laboratory analyst under a controlled environment as required and specified in the laboratory's Quality Assurance (QA) and Quality Control (QC) Plan to ensure the minimum disturbance and maintain the integrity of the sample for subsequent chemical analyses.

If the number of samples collected at a creek site is not evenly divisible by four, some samples may be 2-point composites or 3-point composites. For example, if seven samples are collected at a creek, the samples will be composited into one 4-point composite sample and one 3-point composite sample. Only samples from the same creek site will be composited together.

Only adjacent samples on the same creek will be composited together. For example, if eight samples are collected on a single creek and are numbered one through eight from the downstream end to the upstream end, samples one through four shall be composited together, and samples five through eight shall be composited together.

## **RESIDUAL SEDIMENT SAMPLING**

The purpose of residual sediment sampling is to conduct limited characterization of sediment left behind after sediment removal from earthen channels and creeks. The exposed sediment in the channel/creek bottom will be sampled and analyzed for total mercury and PCB.

## **Sampling Locations**

The samples will be collected from continuous core sediment sample locations previously discussed in this section on "Sampling Methods" by using hand auger from within 1 foot below the maximum depth of dredging at each earthen channel/creek site. After collection of continuous core sample, a hand auger or a backhoe/excavator, if warranted, will be used to collect a discrete sample within 1 foot below depth, and analyzed separately for total mercury and PCB.

The residual sediment sampling locations are locations that have the potential for detecting total mercury and PCB, if any. Such sampling locations shall be determined based on criteria such as known locations of outfalls, storm water runoff locations, and by visually identifying potential sediment deposition areas and industrial sources along the stream stretches where dredging is planned. In this regard, the District will identify the residual sediment sampling locations that best meet these criteria, possibly with the DFG and/or Regional Board during a field visit.

## **Sampling Frequency**

Residual sediment samples will be collected at the same frequency as the continuous core sediment samples on earthen channels only.

Table 2C presents the following information: the sediment removal sites, the approximate location of the sites, the length of work area by stations of the upstream and downstream limits of the sites, the type of site (tidal/nontidal, lining type), the estimated average annual volume of sediment generated at each site, and the average number of sampling locations at each site.

## **FLINT DEBRIS BASIN SAMPLING**

The Flint Debris Basin is a sediment basin located outside the natural stream in the upper watershed. This large sediment basin was constructed to intercept the large sediment load generated by the upstream unstable watershed during high stream flow events. Sediment captured in the basin remains until the District removes it. The basin is not dynamic like natural streams and the sediment-sampling requirement has been modified.

The Flint Debris Basin will be sampled at five locations:

- One continuous core sample taken at the location that has the potential for detecting maximum number of contaminants at highest concentrations at a depth of 11 to 12 feet.
- Residual sample to be taken below this sample at a depth of 12 to 13 feet.

Four continuous core samples, evenly spaced throughout the basin, taken at a depth of 6 feet.

## **SAMPLING PROCEDURES**

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This section describes sampling procedures applicable to both the continuous core sampling and representative sampling methods.

### **SAMPLE COLLECTION**

All samples shall be collected by means of a hand trowel, a hand auger, or another sampling method approved by the regulatory agencies. The individual collecting the sample will have the discretion of choosing the sampling method which is the most efficient to perform.

Sampling will be conducted in accordance with the methods described below:

#### **Hand Trowel Procedure**

1. Remove vegetation and woody debris from the ground surface.
2. If collecting a subsurface sample, use a shovel to dig down to the desired sampling interval.
3. Use a stainless-steel hand trowel to collect soil.
4. Place soil in an appropriate sampling container.
5. Replace all excavated soils to their original location (i.e., backfill the sampling hole).

#### **Hand Auger Procedure**

1. Remove vegetation and woody debris from the ground surface.
2. Use the hand auger to advance down to the top of the sampling interval.
3. Use a hand auger to collect soil from the desired depth.
4. Use a clean (decontaminated) tool to scoop the soil out of the auger and place in an appropriate sampling container.
5. Replace all excavated soils to their original location (i.e., backfill the sampling hole).
6. If hand auger refusal is encountered, sample will be collected from an alternate location.

#### **Continuous Core Sediment Sampling**

Continuous core sediment samples from sediment designated for removal will be collected using hand auger at a frequency of a maximum of one sample per site. Each continuous core sample will be composited by the laboratory, and analyses will be performed on the composite sample.

#### **Discrete Sediment Sampling**

Discrete sediment samples from sediment designated for removal will be collected from desired depths using hand auger. Samples will be composited by the laboratory, and analyses will be performed on the composite sample.

#### **Residual Sediment Sampling**

A hand auger will be used to collect sediment samples within 1 foot below dredging depth. If field subsurface conditions do not allow sampling by hand auger, a backhoe/excavator will be used to expose sediment to specified depth and hand trowel or hand auger will be used to collect sample.

## **Deep Sampling**

For samples to be collected at a depth greater than 4 feet, a backhoe/excavator will be used to expose sediment to specified depth and hand trowel or hand auger will be used to collect sample.

Samples shall be collected by District staff and/or by a contractor.

## **SAMPLE CONTAINERS AND SAMPLE VOLUME**

All samples shall be collected using wide-mouthed glass jars or other sampling containers as directed or supplied by the laboratory.

Sampling volume and number of containers necessary shall be specified by the District's laboratory. It is anticipated that multiple containers of sediment will need to be collected at each location.

## **DECONTAMINATION PROCEDURES**

All equipment used to collect soil samples (hand trowel or hand auger) shall be decontaminated prior to collecting each sample. Equipment shall be decontaminated by washing the equipment with a nonphosphate detergent solution and rinsing the equipment twice with water. The final rinse shall be with deionized or distilled water.

The decontamination liquids will be temporarily stored in labeled containers and transported to the District's Maintenance Yard (Corporation Yard). Upon confirmation by chemical analyses, the decontamination liquids will be disposed appropriately.

## **SAMPLE PRESERVATION**

All samples shall be immediately preserved by placing the samples in an insulated cooler with ice. Samples may also be stored in a refrigerator. All samples shall be kept cool.

A vial of water shall be included in all insulated coolers. The laboratory shall immediately record the temperature of the vial upon receipt of the samples.

## **CHAIN OF CUSTODY PROCEDURES**

Standard chain of custody procedures shall be used throughout the sampling collection procedures. A chain of custody shall be prepared for all samples. Each individual who has responsibility for the samples is required to sign the chain of custody upon relinquishing the samples to another party. The receiving party taking custody of samples shall also sign the chain of custody form.

When in the field, samples shall always be in sight of the individual responsible for the samples, or the samples shall be stored within a locked vehicle. If the samples are stored in an office prior to delivery to the laboratory, the samples shall be stored in a secure location. Applicable sample storage and preservation procedures shall be followed.

A sample chain of custody is presented in Appendix C.

## **FIELD SOIL SAMPLING LOG**

A field soil sampling log shall be filled out for the samples collected at each location. The log will contain the following information: date and time, site location, responsible sample collector, sampling methods, sampling location, sampling depth, number of sampling containers, specific site conditions observed at the time of sample collection, analysis requested, and other information that describes the actual sampling event.

A sample field soil sampling log is presented in Appendix D.

## **SURVEY OF SAMPLING LOCATIONS**

All sampling locations will be identified by station numbers.

## ANALYTICAL PROCEDURES

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The analytical tests and average annual numbers of samples proposed for the continuous core, discrete, and residual sediment samples are summarized in Tables 3A, 3B, and 3C respectively. Tables 3A, 3B, 3C, and 3D present the specific analysis to be performed at each sediment removal site, and Table 4 presents the test methods used for analysis. The continuous core sediment sample locations will be determined during pre-sampling field activities. Proposed standard analytical detection (reporting) limits, and a supporting letter from Sequoia Analytical Laboratory are included in Appendix E. As explained in the letter from Sequoia, lower detection limits may be achievable for specific compounds.

Presented below is a description of the constituents of concern and the rationale used in the selection of analytical test methods.

### RATIONALE FOR ANALYTICAL TEST METHOD SELECTION

The rationale used for selecting test methods is described below:

#### **Metals**

Metals are naturally-occurring elements which are present in sediments and soils throughout the Santa Clara Valley. Historic mining activities has increased metal levels in some watersheds. Metals may also be deposited in the stream by nonpoint source runoff.

Landfills commonly request that soils be analyzed for total concentrations of "Title 26 metals," which includes antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc for a grand total of 17 metals.

Class III landfills may consider both the total and soluble levels of metals; therefore, it is often advisable to test soil for both the total levels of metals, using standard extraction methods, and soluble levels of metals, using the Waste Extraction Test (WET) extraction method. Soluble levels of metals will be determined using the standard WET extraction (which utilizes citric acid).

#### *Selected Test Methods and Frequency of Testing*

- C All samples except the residual sediment samples shall be tested for total Title 26 metals by EPA Method 6010 and EPA 7000 series test methods.
- C All samples except the residual sediment samples will be tested for soluble Title 26 metals by EPA Methods 6010 and 7000 series and standard WET extraction method (citric acid).

#### **Mercury—Total and Methyl-Mercury**

Mercury is a concern due to its presence in some watersheds as a result of historic operations at former mines. Many mercury mines were active up to the 1970s. Past mining operations allowed mining tailings and debris to discharge to some creeks and this has increased mercury levels in sediments and soils in those watersheds. Analysis of total mercury by EPA Method 7471 will be performed for all samples taken from Guadalupe River, Guadalupe Creek, Los Gatos Creek, Alamos Creek, Coyote Creek and Randal Creek. Analysis of methyl-mercury by EPA Method 1631 modified will be performed for all samples taken from Guadalupe River, Guadalupe Creek, Los Gatos Creek, Alamos Creek, Coyote Creek, and Randal Creek.

#### *Selected Test Methods and Frequency of Testing*

- All samples collected from Guadalupe River. Guadalupe Creek, Los Gatos Creek, Alamitos Creek, Coyote Creek, and Randol Creek will be analyzed for total mercury by EPA Method 7471.
- All samples collected from Guadalupe River. Guadalupe Creek, Los Gatos Creek, Alamitos Creek, Coyote Creek, and Randol Creek will be analyzed for methyl-mercury by EPA Method 1630 modified.

### **Pesticides and Organophosphorous Compounds**

Pesticides have been historically used throughout the Santa Clara Valley for agricultural purposes. Both pesticides and organophosphorous compounds may have been deposited in the sediments by nonpoint source runoff. Analysis of pesticides will be performed by EPA Method 8081, all samples will be tested for pesticides. Analysis of organophosphorous compounds will be performed by EPA Method 8141 on samples taken from earthen channels/creeks.

#### *Selected Test Methods and Frequency of Testing*

All samples except the residual sediment samples will be tested for pesticides by EPA Method 8081. All samples from earthen channels/creeks, except the residual sediment samples will be tested for organophosphorous compounds by EPA Method 8141.

Unless specifically indicated above, testing shall be distributed evenly throughout the sites.

### **Herbicide Compounds**

The District applies herbicides on upland maintenance roads to manage vegetation and instream to manage aquatic vegetation. Roundup, Rodeo, and Pendulum are the most commonly applied compounds. Gallery, Surflan, and Telar are also applied.

#### *Selected Test Methods and Frequency of Testing*

Analysis of Roundup and Rodeo will be performed by EPA Method 547s modified on samples taken from ten sites where the compound was applied, with the largest volume of sediment to be removed. Analysis of Pendulum will be performed by EPA Method 8141 modified on samples taken from ten sites where the compound was applied, with the largest volume of sediment to be removed. Analysis of Gallery will be performed by Method CDFA modified on samples taken from three sites where the compound was applied, with the largest volume of sediment to be removed. Analysis of Surflan will be performed by EPA Method 632 modified on samples taken from three sites where the compound was applied, with the largest volume of sediment to be removed. Analysis of Telar will be performed by EPA Method 632 modified on samples taken from three sites where the compound was applied, with the largest volume of sediment to be removed.

### **Polychlorinated Biphenyls and Total Mercury**

Sediment samples collected from the residual sediment at selected locations will be analyzed for PCB and total mercury in an attempt to characterize sediments that may be subject to erosion and transport during flows.

### *Selected Test Method and Frequency of Testing*

All residual sediment samples collected from earthen channels/creeks will be tested for total mercury and PCB by EPA Methods 7471 and 8082, respectively.

### **Solvents**

Solvents are generated by industrial activities and may be deposited in sediments by nonpoint sources runoff. Solvents are highly volatile, so it is not likely that significant quantities of solvents will be detected, since the sediments are open to the atmosphere.

None of the seventeen (17) composite samples from eight (8) creeks, analyzed for halogenated volatiles in 1997 revealed presence of halogenated volatiles above detection limits. Also, none of the fifty-four (54) composite samples from nineteen (19) creeks, analyzed for halogenated volatiles in 1998 revealed presence of halogenated volatiles above detection limits. This comparison of sediment analyses was discussed at the 1998 Lessons Learned meeting.

Testing of samples by EPA Method 8010 for halogenated volatiles was not performed in 1999, 2000, or 2001 and will also not be performed during the Multi-Year Sediment Removal Program.

### **Polynuclear Aromatic Hydrocarbons**

PAH is generated by industrial activities and may be deposited in sediments by nonpoint source runoff. The sediments will be tested by EPA Method 8310 for PAH.

### *Selected Test Method and Frequency of Testing*

All samples except the residual sediment samples will be analyzed for PAH by EPA Method 8310.





**Table 3A**  
**Multi-Year Sediment Removal Sites**  
**Summary of Analysis Performed at Each Site<sup>(a)</sup>**  
**(Average Annual Continuous Core Sediment Sampling)**

Site No.	Sediment Removal Sites	Average Annual Estimated Volume Per Creek (CY)	Average Annual Number of Samples	Average Annual Number of Samples Tested for Individual Analytes																
				Total Metals	Metals WET	Mercury	Pesticides	Organo. <sup>(b)</sup> Comp.	P A H	Moisture Content	Grain Size	T H E	Toxicity <sup>(c)</sup>	TOC	Asbestos	Chloride <sup>(c)</sup>	pH	Total Sulfides	Ammonia	Atterberg Limits
Lower Peninsula Watershed (Northwest Zone)																				
1	Adobe	2,480	1	1	1	0	1	0	1	1	1	1	0	1	1	0	1	1	1	1
2	Baron Debris Basin	500	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
3	Matadero	1,560	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
4	Permanente Diversion	200	1	1	1	0	1	0	1	1	1	1	0	1	1	0	1	1	1	1
5	Permanente	700	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
6	San Francisquito	1,350	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7	Stevens	7,000	2	2	2	0	2	1	2	1	1	1	2	1	1	1	1	1	1	1
West Valley Watershed (North Central Zone)																				
8	Calabazas	1,300	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
9	Junipero Serra Channel	100	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
10	Regnart	100	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
11	Rodeo	180	1	1	1	0	1	0	1	1	1	1	0	1	1	0	1	1	1	1
12	San Tomas Aquino	10,650	3	3	3	0	3	1	3	1	1	1	1	1	1	1	1	1	1	1
13	Saratoga	3,550	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1

Site No.	Sediment Removal Sites	Average Annual Estimated Volume Per Creek (CY)	Average Annual Number of Samples	Average Annual Number of Samples Tested for Individual Analytes																
				Total Metals	Metals WET	Mercury	Pesticides	Organo. (b) Comp.	p A H	Moisture Content	Grain Size	T H E	Toxicity (c)	TOC	Asbestos	Chloride (c)	pH	Total Sulfides	Ammonia	Atterberg Limits
14	Smith	20	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
15	Sunnyvale East	3,200	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
16	Sunnyvale West	900	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
17	El Camino Storm Drain	120	1	1	1	0	1	0	1	1	1	1	0	1	1	0	1	1	1	1
<b>Guadalupe Watershed (Central Zone)</b>																				
18	Canoas	4,800	2	2	2	0	2	0	2	1	1	1	0	1	1	0	1	1	1	1
19	Greystone	500	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
20	Guadalupe River	9,400	3	3	3	3	3	1	3	1	1	1	2	1	1	1	1	1	1	1
21	Ross	800	1	1	1	0	1	0	1	1	1	1	0	1	1	0	1	1	1	1
22	Guadalupe	150	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1
23	Randol	300	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1
24	Berryessa	9,750	3	3	3	0	3	1	3	1	1	1	1	1	1	1	1	1	1	1
25	Calera	900	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
26	Fisher	100	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
27	Los Coches	300	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
28	Lower Silver	4,480	2	2	2	0	2	1	2	1	1	1	0	1	1	0	1	1	1	1
29	Miguelita	450	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
30	Upper Penitencia	120	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
31	Lower Penitencia	5,000	2	2	2	0	2	1	2	1	1	1	1	1	1	1	1	1	1	1
32	Sierra	750	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
33	Upper Silver	200	1	1	1	0	1	0	1	1	1	1	0	1	1	0	1	1	1	1

Site No.	Sediment Removal Sites	Average Annual Estimated Volume Per Creek (CY)	Average Annual Number of Samples	Average Annual Number of Samples Tested for Individual Analytes																
				Total Metals	Metals WET	Mercury	Pesticides	Organo. (b) Comp.	p A H	Moisture Content	Grain Size	T H E	Toxicity (c)	TOC	Asbestos	Chloride <sup>(c)</sup>	pH	Total Sulfides	Ammonia	Atterberg Limits
34	Tularcitos	700	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
35	Norwood	360	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
36	Thompson	100	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
	<b>TOTAL</b>	<b>73,070</b>	<b>46</b>	<b>46</b>	<b>46</b>	<b>5</b>	<b>46</b>	<b>29</b>	<b>46</b>	<b>36</b>	<b>36</b>	<b>36</b>	<b>10</b>	<b>36</b>	<b>36</b>	<b>8</b>	<b>36</b>	<b>36</b>	<b>36</b>	<b>36</b>

**Table 3B**  
**Multi-Year Sediment Removal Sites**  
**Summary of Analysis Performed at Each Site <sup>(a)</sup>**  
**(Annual Average Discrete Sediment Sampling)**

Site No.	Sediment Removal Sites	Average Annual Estimated Volume Per Creek (CY)	Average Annual Number of Samples	Average Annual Number of Composites	Average Annual Number of Samples Tested for Individual Analytes																
					Total Metals	Metals WET	Mercury	Pesticides	Organo. <sup>(a)</sup> Comp.	PAH	Moisture Content	Grain Size	THE	Toxicity <sup>(b)</sup>	T O C	Asbestos	Chloride <sup>(b)</sup>	p H	Total Sulfides	Ammonia	Atterberg Limits
Lower Peninsula Watershed (Northwest Zone)																					
1	Adobe	2,480	3	1	1	1	0	1	0	1	1	1	1	0	1	1	0	1	1	1	1
2	Baron Debris Basin	500	1	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
3	Matadero	1,560	2	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
4	Permanent e Diversion	200	1	1	1	1	0	1	0	1	1	1	1	0	1	1	0	1	1	1	1
5	Permanent e	700	1	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
6	San Francisquito	1,350	2	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7	Stevens	7,000	7	2	2	2	0	2	2	2	2	2	2	1	2	2	1	2	2	2	2
West Valley Watershed (North Central Zone)																					
8	Calabazas	1,300	2	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
9	Junipero Serra Channel	100	1	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
10	Regnart	100	1	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
11	Rodeo	180	1	1	1	1	0	1	0	1	1	1	1	0	1	1	0	1	1	1	1
12	San Tomas	10,650	11	3	3	3	0	3	3	3	3	3	3	2	3	3	2	3	3	3	3

**Table 3B**  
**Multi-Year Sediment Removal Sites**  
**Summary of Analysis Performed at Each Site <sup>(a)</sup>**  
**(Annual Average Discrete Sediment Sampling)**

Site No.	Sediment Removal Sites	Average Annual Estimated Volume Per Creek (CY)	Average Annual Number of Samples	Average Annual Number of Composites	Average Annual Number of Samples Tested for Individual Analytes																
					Total Metals	Metals WET	Mercury	Pesticides	Organo. (a) Comp.	PAH	Moisture Content	Grain Size	THE	Toxicity (b)	T O C	Asbestos	Chloride (b)	p H	Total Sulfides	Ammonia	Atterberg Limits
	Aquino																				
13	Saratoga	3,550	4	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
14	Smith	20	1	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
15	Sunnyvale East	3,200	4	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
16	Sunnyvale West	900	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
17	El Camino Storm Drain	120	1	1	1	1	0	1	0	1	1	1	1	0	1	1	0	1	1	1	1
<b>Guadalupe Watershed (Central Zone)</b>																					
18	Canoas	4,800	5	2	2	2	0	2	0	2	2	2	2	0	2	2	0	2	2	2	2
19	Greystone	500	1	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
20	Guadalupe River	9,400	10	3	3	3	3	3	3	3	3	3	3	2	3	3	2	3	3	3	3
21	Ross	800	1	1	1	1	0	1	0	1	1	1	1	0	1	1	0	1	1	1	1
22	Guadalupe	150	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1
23	Randol	300	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1
<b>Coyote Watershed (East Zone)</b>																					
24	Berryessa	9,750	10	3	3	3	0	3	3	3	3	3	3	1	3	3	1	3	3	3	3
25	Calera	900	1	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1

**Table 3B**  
**Multi-Year Sediment Removal Sites**  
**Summary of Analysis Performed at Each Site <sup>(a)</sup>**  
**(Annual Average Discrete Sediment Sampling)**

Site No.	Sediment Removal Sites	Average Annual Estimated Volume Per Creek (CY)	Average Annual Number of Samples	Average Annual Number of Composites	Average Annual Number of Samples Tested for Individual Analytes																
					Total Metals	Metals WET	Mercury	Pesticides	Organo. (a) Comp.	PAH	Moisture Content	Grain Size	THE	Toxicity (b)	T O C	Asbestos	Chloride <sup>(b)</sup>	p H	Total Sulfides	Ammonia	Atterberg Limits
26	Fisher	100	1	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
27	Los Coches	300	1	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
28	Lower Silver	4,480	5	2	2	2	0	2	2	2	2	2	2	0	2	2	0	2	2	2	2
29	Miguelita	450	1	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
30	Upper Penitencia	120	1	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
31	Lower Penitencia	5,000	5	2	2	2	0	0	2	2	2	2	2	1	2	2	1	2	2	2	2
32	Sierra	750	1	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
33	Upper Silver	200	1	1	1	1	0	1	0	1	1	1	1	0	1	1	0	1	1	1	1
34	Tularcitos	700	1	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
35	Norwood	360	1	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
36	Thomson	100	1	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1
	<b>TOTAL</b>	<b>73,070</b>	<b>93</b>	<b>46</b>	<b>46</b>	<b>46</b>	<b>5</b>	<b>46</b>	<b>38</b>	<b>46</b>	<b>46</b>	<b>46</b>	<b>46</b>	<b>10</b>	<b>46</b>	<b>46</b>	<b>10</b>	<b>46</b>	<b>46</b>	<b>46</b>	<b>46</b>

**Table 3B**  
Multi-Year Sediment Removal Sites  
Summary of Analysis Performed at Each Site <sup>(a)</sup>  
(Annual Average Discrete Sediment Sampling)



**Table 3C**  
Multi-Year Sediment Removal Sites  
Summary of Analysis Performed at Each Site <sup>(a)</sup>  
(Annual Average Residual Sediment Sampling)

Site No.	Sediment Removal Sites	Annual Average Estimated Volume Per Creek (CY)	Average Annual Total Number of Samples	Average Annual Number of Samples Tested for Individual Analytes	
				Total <sup>(b)</sup> Mercury	PCB <sup>(b)</sup>
Lower Peninsula Watershed (Northwest Zone)					
1	Adobe	2,480	0	0	0
2	Baron Debris Basin	500	1	1	1
3	Matadero	1,560	1	1	1
4	Permanente Diversion	200	0	0	0
5	Permanente	700	1	1	1
6	San Francisquito	1,350	1	1	1
7	Stevens	7,000	2	2	2
West Valley Watershed (North Central Zone)					
8	Calabazas	1,300	1	1	1
9	Junipero Serra Channel	100	1	1	1
10	Regnart	100	1	1	1
11	Rodeo	180	0	0	0
12	San Tomas Aquino	10,650	3	3	3
13	Saratoga	3,550	1	1	1
14	Smith	20	1	1	1
15	Sunnyvale East	3,200	1	1	1
16	Sunnyvale West	900	1	1	1

**Table 3C**  
Multi-Year Sediment Removal Sites  
Summary of Analysis Performed at Each Site <sup>(a)</sup>  
(Annual Average Residual Sediment Sampling)

Site No.	Sediment Removal Sites	Annual Average Estimated Volume Per Creek (CY)	Average Annual Total Number of Samples	Average Annual Number of Samples Tested for Individual Analytes	
				Total <sup>(b)</sup> Mercury	PCB <sup>(b)</sup>
17	El Camino Storm Drain	120	0	0	0
<b>Guadalupe Watershed (Central Zone)</b>					
18	Canoas	4,800	0	0	0
19	Greystone	500	1	1	1
20	Guadalupe River	9,400	3	3	3
21	Ross	800	0	0	0
22	Guadalupe	150	1	1	1
23	Randol	300	1	1	1
<b>Coyote Watershed ( East Zone)</b>					
24	Berryessa	9,750	3	3	3
25	Calera	900	1	1	1
26	Fisher	100	1	1	1
27	Los Coches	300	1	1	1
28	Lower Silver	4,480	2	2	2
29	Miguelita	450	1	1	1
30	Upper Penitenica	120	1	1	1
31	Lower Penitencia	5, 000	2	2	2
32	Sierra	750	1	1	1
33	Upper Silver	200	0	0	0

**Table 3C**  
Multi-Year Sediment Removal Sites  
Summary of Analysis Performed at Each Site <sup>(a)</sup>  
(Annual Average Residual Sediment Sampling)

Site No.	Sediment Removal Sites	Annual Average Estimated Volume Per Creek (CY)	Average Annual Total Number of Samples	Average Annual Number of Samples Tested for Individual Analytes	
				Total <sup>(b)</sup> Mercury	PCB <sup>(b)</sup>
34	Tularcitos	700	1	1	1
35	Norwood	360	1	1	1
36	Thompson	100	1	1	1
	<b>TOTAL</b>	<b>73,070</b>	<b>38</b>	<b>38</b>	<b>38</b>

**Table 3D**  
Multi-Year Sediment Removal Sites  
Summary of Analysis Performed at Each Site  
(Average Annual Herbicide Sampling)

Site No.	Sediment Removal Sites	Average Annual Estimated Volume Per Creek (CY)	Average Annual Total Number of Samples	Average Annual Number of Samples Tested for Individual Analytes					
				Roundup	Rodeo	Pendulum	Gallery	Surflan	Telar
Lower Peninsula Watershed (Northwest Zone)									
1	Adobe	2,480	TBD	TBD	TBD	TBD	TBD	TBD	TBD
2	Baron Debris Basin	500	TBD	TBD	TBD	TBD	TBD	TBD	TBD
3	Matadero	1,560	TBD	TBD	TBD	TBD	TBD	TBD	TBD
4	Permanente Diversion	200	TBD	TBD	TBD	TBD	TBD	TBD	TBD
5	Permanente	700	TBD	TBD	TBD	TBD	TBD	TBD	TBD
6	San Francisquito	1,350	TBD	TBD	TBD	TBD	TBD	TBD	TBD
7	Stevens	7,000	TBD	TBD	TBD	TBD	TBD	TBD	TBD
West Valley Watershed (North Central Zone)									
8	Calabazas	1,300	TBD	TBD	TBD	TBD	TBD	TBD	TBD
9	Junipero Serra Channel	100	TBD	TBD	TBD	TBD	TBD	TBD	TBD
10	Regnart	100	TBD	TBD	TBD	TBD	TBD	TBD	TBD
11	Rodeo	100	TBD	TBD	TBD	TBD	TBD	TBD	TBD
12	San Tomas Aquino	10,650	TBD	TBD	TBD	TBD	TBD	TBD	TBD
13	Saratoga	3,550	TBD	TBD	TBD	TBD	TBD	TBD	TBD

**Table 3D**  
Multi-Year Sediment Removal Sites  
Summary of Analysis Performed at Each Site  
(Average Annual Herbicide Sampling)

Site No.	Sediment Removal Sites	Average Annual Estimated Volume Per Creek (CY)	Average Annual Total Number of Samples	Average Annual Number of Samples Tested for Individual Analytes					
				Roundup	Rodeo	Pendulum	Gallery	Surflan	Telar
14	Smith	20	TBD	TBD	TBD	TBD	TBD	TBD	TBD
15	Sunnyvale East	3,200	TBD	TBD	TBD	TBD	TBD	TBD	TBD
16	Sunnyvale West	900	TBD	TBD	TBD	TBD	TBD	TBD	TBD
17	El Camino Storm Drain	120	TBD	TBD	TBD	TBD	TBD	TBD	TBD
<b>Guadalupe Watershed (Central Zone)</b>									
18	Canoas	4,800	TBD	TBD	TBD	TBD	TBD	TBD	TBD
19	Greystone	500	TBD	TBD	TBD	TBD	TBD	TBD	TBD
20	Guadalupe River	9,400	TBD	TBD	TBD	TBD	TBD	TBD	TBD
21	Ross	800	TBD	TBD	TBD	TBD	TBD	TBD	TBD
22	Guadalupe	150	TBD	TBD	TBD	TBD	TBD	TBD	TBD
23	Randol	300	TBD	TBD	TBD	TBD	TBD	TBD	TBD
<b>Coyote Watershed (East Zone)</b>									
24	Berryessa	9,750	TBD	TBD	TBD	TBD	TBD	TBD	TBD
25	Calera	900	TBD	TBD	TBD	TBD	TBD	TBD	TBD
26	Fisher	100	TBD	TBD	TBD	TBD	TBD	TBD	TBD
27	Los Coches	300	TBD	TBD	TBD	TBD	TBD	TBD	TBD

**Table 3D**  
Multi-Year Sediment Removal Sites  
Summary of Analysis Performed at Each Site  
(Average Annual Herbicide Sampling)

Site No.	Sediment Removal Sites	Average Annual Estimated Volume Per Creek (CY)	Average Annual Total Number of Samples	Average Annual Number of Samples Tested for Individual Analytes					
				Roundup	Rodeo	Pendulum	Gallery	Surflan	Telar
28	Lower Silver	4,480	TBD	TBD	TBD	TBD	TBD	TBD	TBD
29	Miguelita	450	TBD	TBD	TBD	TBD	TBD	TBD	TBD
30	Upper Penitenica	120	TBD	TBD	TBD	TBD	TBD	TBD	TBD
31	Lower Penitencia	5, 000	TBD	TBD	TBD	TBD	TBD	TBD	TBD
32	Sierra	750	TBD	TBD	TBD	TBD	TBD	TBD	TBD
33	Upper Silver	200	TBD	TBD	TBD	TBD	TBD	TBD	TBD
34	Tularcitos	700	TBD	TBD	TBD	TBD	TBD	TBD	TBD
35	Norwood	360	TBD	TBD	TBD	TBD	TBD	TBD	TBD
36	Thompson	100	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	<b>TOTAL</b>	<b>73,070</b>							

**Table 4**  
**Multi-Year Sediment Removal Program**  
**Analytical Test Methods**

<b>Analyte</b>	<b>Test Method</b>
Total CAM 17 Metals—100 percent of samples	EPA 6010 and 7000 series
Soluble CAM 17 Metals—100 percent of samples	EPA 6010 and 7000 series (Standard WET)
Total Mercury—100 percent of samples from Guadalupe, Los Gatos, Alamitos, and Coyote Creeks	EPA 7471, or equivalent
Methyl-mercury—100 percent of samples from Guadalupe, Los Gatos, Alamitos, and Coyote Creeks	EPA 1630 Modified
Pesticides—100 percent of samples	EPA 8081
Organophosphorous Compounds—100 percent of samples from earthen channels only	EPA 8141
Herbicide Compounds—Ten sites where applied, with largest sediment removal volume Roundup Rodeo Pendulum	EPA Method 547s modified EPA Method 547s modified EPA Method 8141 modified
Herbicide Compounds—Three sites where applied, with largest sediment removal volume Gallery Surflan Telar	Method CDFA modified EPA Method 632 modified EPA Method 632 modified
PAH—100 percent of samples	EPA 8310
Moisture Content—100 percent of samples	EPA 160.3
Grain Size Analysis—100 percent of samples	American Society for Testing and Materials (ASTM) D422 Sieve and Hydrometer (if over 10 percent fines)
Total Extractable Hydrocarbons—Kerosene/Diesel	EPA 8015 Modified
Toxicity Screening—Tidal site samples	U.S. Army Corps of Engineers Inland Testing

**Table 4**  
**Multi-Year Sediment Removal Program**  
**Analytical Test Methods**

<b>Analyte</b>	<b>Test Method</b>
	Manual, February 1998 (percent survival—Eohaustorius estaurius)
Total Organic Carbon—100 percent of samples	EPA 415.2 or equivalent
Asbestos—100 percent of samples	PLM
Chloride—On all samples from tidal areas	EPA 300.0 or equivalent
pH—100 percent of samples	EPA 150.1 or equivalent
Atterberg Limits—100 percent of samples	ASTM D4318
PCB - On all residual sediment samples in earthen channels	EPA 8082
Total Mercury-On all residual sediment samples in earthen channels	EPA 7471, or equivalent

### **Moisture Content**

Sediments in creeks naturally contain moisture; moisture content may fluctuate during the year and is dependant on creek flows, groundwater elevation, and other local conditions. The moisture content of in-situ soils will be higher than the moisture content of excavated sediments, due to the natural process of evaporation and infiltration.

Analysis of moisture content is required for Class III landfill acceptance for wet soils. In addition, it is necessary to measure the moisture content in order to determine the dry weight concentrations of constituents within the sediment.

#### *Selected Test Method and Frequency of Testing*

All samples except residual sediment samples shall be analyzed for moisture content by EPA Method 160.3

### **Total Organic Carbon**

Organic matter occurs naturally in sediment due to the plant and animal life. Organic matter may also be deposited in the creek by nonpoint source runoff.



The percentage of organic matter in the sediment is of concern because soils with high levels of organic content may be considered putrescent. The levels of organic content are also important if the sediments are to be used as a soil amendment or as structural fill.

*Selected Test Method and Frequency of Testing*

All samples except residual sediment samples shall be analyzed for TOC by EPA Method 415.2.

**Salinity**

Sediments in tidal areas may contain elevated levels of salinity. Salinity is of concern because it may be toxic to freshwater aquatic life. Class III landfills may also have restrictions on salinity levels.

Representatives from a local Class III landfill recommended that saline sediments be tested for chloride in order to receive landfill acceptance.

*Selected Test Method and Frequency of Testing*

All samples in tidal areas only except residual sediment samples shall be sampled for chloride by EPA Method 300.0.

**Physical Parameters**

The physical parameters of the sediments must be known to determine if a sediment is suitable for reuse as a construction material, or as a topsoil or soil amendment. Physical parameters of concern include grain size distribution and Atterberg Limits (liquid limit and plastic limit).

Grain size distribution is measured using both sieves and a hydrometer; sieves classify the coarse-grained fraction (sand and gravel), while a hydrometer classifies the fine-grained fraction (clays and silts). The sieve test can be used to determine the distribution of the coarse-grained materials, but not the distribution of the fines. Sediments with significant quantities of fines (greater than 10 percent passing a No. 200 sieve), should be analyzed by the hydrometer method to determine the distribution of the fines. Sediments with few fines (less than 10 percent passing No. 200 sieve) do not require hydrometer analysis; because the percentage of fines is so small.

The Atterberg Limits are used to determine the engineering properties of fine-grained soils passing a No. 40 sieve (clays, silts, and fine sands). ASTM Test Method 4318 for Atterberg Limits describes different test preparation methods, including Method A (wet preparation method) and Method B (dry preparation method). Method A is more accurate than Method B; however, Method A is also more costly. Mr. David Cooper, owner of Cooper Testing Labs, an independent geotechnical laboratory in Mountain View, California, has performed both Method A and Method B and has stated that the difference in accuracy is minimal.

District engineers recommend that soils be tested for grain size distribution and plasticity index. In addition, the representative of a local Class III landfill recommends that sediments used as engineered fill be tested for the plasticity index by the WET method.

*Selected Test Methods and Frequency of Testing*

All samples except residual sediment samples shall be tested for grain size distribution using sieves to determine the distribution of the coarse fraction by ASTM Method D422—sieve test.

Samples containing greater than 10 percent fines (as determined by the sieve test) shall be tested for grain size distribution using the hydrometer by ASTM D422—hydrometer.

All samples except residual sediment samples shall be tested for Atterberg Limits by ASTM Method D4318 and Method B (dry preparation).

### **Petroleum Products**

Petroleum products may be present in the sediment due to nonpoint sources of pollution which are washed into the creek. Petroleum products which may have been deposited in the creek over time include heavier hydrocarbons (such as motor oil). Since the creek is a system which is open to the atmosphere, it is not likely that the sediments will contain volatile hydrocarbons.

Analytical test methods for petroleum products have been known to give misleading results, due to the fact that many standard test methods do not test specifically for petroleum products, but instead test for carbon chains found in the range of the petroleum product. Sediments and soils near a creek contain a lot of vegetation, and the carbon chains in decomposing vegetation are often the same length as petroleum product carbon chains. Historically, this has resulted in many false “positive tests” for diesel and other petroleum products. Because of the high rate of “false positives,” petroleum testing should be analyzed by a gas chromatography method, and the results should always be compared to chromatograph standards for petroleum products. If results do not match standard chromatographs for petroleum products, the samples may not contain petroleum.

All samples will be analyzed for heavier hydrocarbons for total extractable hydrocarbons (THE-Kerosene, Diesel)) by California LUFT Modified 8015 method.

#### *Selected Test Methods and Frequency of Testing*

All samples except residual sediment samples shall be analyzed for total extractable petroleum hydrocarbons, for petroleum in the range of C8 through C28, by California LUFT Modified 8015 method (THE-Kerosene, Diesel).

### **Toxicity**

Creek sediments may be toxic due to nonpoint source pollutants which may have been deposited into the creeks. Toxicity is of concern if the sediment is to be reused. Sediment toxicity test will be conducted only on composite samples from sites where the waters may not be controlled during sediment removal operations due to tidal action.

#### *Selected Test Method and Frequency of Testing*

All samples in tidal areas only except residual sediment samples shall be tested for toxicity by means of a toxicity screening bioassay, by the test method specified in California Code of Regulations, Title 22. The samples will be tested using *Eohaustorius estuarius* species.

### **pH**

The pH of sediments is of concern for sediment reuse. Extremely high or low pH may indicate contamination. In addition, pH is useful for determining the suitability of the soil for reuse as a topsoil or soil amendment.

#### *Selected Test Method and Frequency of Testing*

All samples except residual sediment samples shall be tested for pH by EPA Method 150.1.

## **Asbestos**

Asbestos may be present in sediments due to the presence of asbestos-containing serpentine rock formations within the Santa Clara Valley. Serpentine rock may have been used in the construction of levees constructed by landowners; therefore, there is a possibility that asbestos may be present in sites where there are no serpentine formations.

### *Selected Test Method and Frequency of Testing*

All samples except residual sediment samples shall be analyzed by EPA Method 600R-93-116 (phase light microscopy).

## **Quality Control Samples**

The following QA sampling and analyses shall be conducted:

### *Field Duplicates*

Duplicate samples shall be collected at a rate of 10 percent of all analysis. Duplicate samples shall be analyzed for chemical parameters. No duplicate sampling shall be conducted for physical parameters.

Duplicates shall be submitted blind to the laboratory. Duplicate samples shall be equally distributed over the Sediment Removal Project sites and shall be collected at regular intervals.

Sampling precision is dependant upon both the sampling technique and the naturally-occurring small-scale heterogeneity in the media being sampled. Soil is a heterogeneous media and it is natural to encounter variations in the duplicate samples. Lack of precision in duplicate samples may indicate that either there is a problem in the sampling and analysis techniques, or it may indicate that the soil is very heterogeneous.

### *Laboratory Quality Control Samples*

The laboratory shall perform matrix spike and lab duplicate analysis on samples at a rate of one per 20 samples. Laboratory QC samples shall be conducted for chemical parameters. No laboratory QC samples shall be conducted for physical parameters.

### *Detection Limits*

Actual detection limits will be reported in the final report summary along with the results of the QA/QC samples, field and laboratory duplicates and blanks, matrix spike blanks, and matrix spike duplicates. A copy of the detection (reporting) limits on all analytical services, provided by the state-certified laboratory under contract with the District, are provided in Appendix E.

## **Turnaround Time**

The standard laboratory turnaround time utilized shall be 2 weeks. Expedited 3-day turnaround time will be used for some samples to ensure that the Sediment Removal Project is completed in the summer of this year.

## **Laboratory**

A laboratory certified by the State of California Department of Health Services under the Environmental Laboratory Accreditation Program for the analysis of drinking water, wastewater, and hazardous waste will be used as the primary laboratory for this project.

## **REPORTING**

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Upon receipt of the analytical results from the laboratory, the District shall compile the analytical results into a single report. The purpose of the report shall be to summarize the data in a form that is easy to comprehend. The purpose of the report is not to interpret the data nor is it to determine if the data provides a statistically representative characterization of the sediments. The analytical results report will be available for review by applicable regulatory agencies before the start of sediment removal operations.

## **SCREENING**

In accordance with the WDR, the sediment will be disposed of “at a permitted landfill or otherwise at a site approved by the Executive Officer of the Regional Board.”

It is anticipated that the sediment will be disposed of or reused at a permitted landfill and/or reused as construction fill.

In order for the sediment to be accepted at a permitted landfill, the sediment must meet the acceptance criteria of the individual landfill.

In order for the sediment to be reused as construction fill, the site must be approved by the Executive Officer of the Regional Board.

**APPENDIX A**  
**Random Number Generator Tables**

*Appendices Not Available Electronically*

**APPENDIX B**  
**Selection of Sampling Locations—Sample Exercise**

*Appendices Not Available Electronically*



**APPENDIX C**  
**Chain of Custody Form**

*Appendices Not Available Electronically*

**APPENDIX D**  
**Field Soil Sampling Log**

*Appendices Not Available Electronically*

**APPENDIX E**  
**Proposed Analytical Detection (Reporting) Limits**

*Appendices Not Available Electronically*